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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/737,184	12/16/2003	Ragip Kurceren	944-001.121	5545

4955 7590 10/30/2008

WARE FRESSOLA VAN DER SLUYS & ADOLPHSON, LLP
BRADFORD GREEN, BUILDING 5
755 MAIN STREET, P O BOX 224
MONROE, CT 06468

EXAMINER	
WERNER, DAVID N	
ART UNIT	**PAPER NUMBER**
2621	
MAIL DATE	**DELIVERY MODE**
10/30/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/737,184	KURCEREN ET AL.	
	Examiner	Art Unit	
	David N. Werner	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 August 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-19,21-23,25,27-29,31 and 32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-19,21-24,27-29,31 and 32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *20081014*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. This Office action for US Patent Application 10/737,184 is in response to the Request for Continued Examination filed 07 August 2008, in reply to the Final Rejection of 02 May 2008. Currently, claims 2-19, 21-23, 25, 27-29, and 31-32 are pending. Claims 20, 24, 26, and 30 are newly canceled.

2. In the previous Office action, claims 2-10 and 13-31 were rejected under 35 U.S.C. 103(a) as obvious over US 5,802,226 A (Dischert et al.) in view of US 6,526,099 B1 (Christopolous et al.). Claims 11, 12, and 32 were rejected under 35 U.S.C. 103(a) as obvious over Dischert et al. in view of Christopolous et al. and US 5,477,276 A (Oguro).

Continued Examination Under 37 CFR 1.114

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 07 August 2008 has been entered.

Information Disclosure Statement

The information disclosure statement filed 14 October 2008 fails to comply with the provisions of 37 CFR 1.98(b)(5) and MPEP § 609 because the documents cited therein are not identified by publication date including at least month and year. It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609.05(a).

Response to Arguments

4. Applicant's arguments filed with respect to claims 2, 13, and 18 have been fully considered but they are not persuasive.

5. Applicant first argues that Dischert et al. does not disclose transform coefficients "representative of residual data" (pp. 8-9). It is respectfully submitted that while Dischert et al. does not explicitly mention residual data, it was commonly known in the art at the time of the present invention that in a DCT-based digital video codec such as the one described in Dischert et al., video frames may be classified into I frames, P frames, or B frames, of which I frames comprise independently-coded data, and P frames and B frames comprise motion vector data and residual data from motion compensating the I frames over time. The encoder of Christopolous et al. demonstrates

this process, such as with motion compensator 122 in figure 1, motion compensator 307 in figure 3a., &c. Christopolous et al. states, in column 1: lines 26-49 and 61-67; and column 2: lines 1-14, that performing motion compensation on digital video data such as that found in Dischert et al. would greatly improve the compression ratio, achieving video of reasonable quality over a relatively narrow channel. Even if the encoder of Dischert et al. does not teach motion compensation, it is respectfully submitted that it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Dischert et al. to operate on motion-compensated video, or to modify Dischert et al. to perform motion compensation, with the predictable improved result of a more efficiently compressed video that takes advantage of temporal redundancy between frames, and thus is able to be transmitted over a more narrow channel than a series of independently coded digital video frames alone since it has been held that to apply a known technique to a known device, method, or product ready for improvement to yield predictable results involves only routine skill in the art. MPEP 2143(D), *Dann v. Johnston*, 425 U.S. 219, 189 USPQ 257 (1976), *In re Nilssen*, 851 F.2d 1401, 7 USPQ2d 1400 (Fed. Cir. 1988).

6. Applicant next states that it would be improper to make the above modification to Dischert et al., since such a modification would be incompatible with the shufflers of Dischert et al., and thus either render the modified Dischert et al. device inoperable, or require removal of the shufflers, which would constitute an improper substantial reconstruction and redesign of the Dischert device (pp. 9-11), and because of this, there would be no rationale to modify the references (pp. 11-13). Applicant further states that

this would be the case regardless of whether the shuffling of Dischert et al. was inter-frame or intra-frame.

First, it is respectfully submitted that even if the claimed "shuffling" was performed on an inter-frame basis, it would still be proper to perform the combination with Christopolous et al. Christopolous et al. is directed to several video standards, such as H.261 or H.263 (column 3: lines 15-17). It was known in the art at the time of the present invention to transmit motion-compensated pictures in a different order than playback, so that a picture that is dependent on a future temporal picture as a reference may receive that picture prior to playback. See H.263 §§O.1–O.2. This re-ordering would be encompassed by the claimed "shuffling" of Christopolous et al.

Second, it is respectfully submitted that even if the claimed "shuffling" was a re-arrangement of portions of sub-frame data on physical tracks of a video cassette tape, as argued, this would not prevent the shuffling from being compatible with residual data. Applicant states that in data shuffling, "the portion of the video data scanned in one frame may not be the same portion that is scanned in the other frame". However, it does not appear that the shuffling in either Dischert or the Kim et al. reference presented as evidence does not output scrambled video data in which one portion of data moves about a display as it is repeatedly scanned and played, even if the data may be found in a different portion of a track in different instances as taught in Kim et al. Applicant states in pages 10 and 11 that residual data must be based on reference data in a physical scanned location that remains the same for each instance. For this assumption to be valid, it must be inferred that the physical location of each repeated

scan of a portion of data must remain the same to enable slow-speed playback as well. Although Kim et al. is focused mainly on recording and does not disclose details of a playback mode, it appears that during playback, the shuffled data is reconstructed back to an original order, presumably based on identification signal Id (column 5: line 18) and within buffer 30. It is respectfully submitted that according to a conventional shuffling operation, physical location of data on a recording medium such as a does not necessarily correspond with location of the location of the decoded data on a display. Therefore, extracting residual data from video data that is shuffled on a recording medium is possible.

Considering the above, all prior art rejections are maintained.

Claim Objections

7. Claim 21 objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Currently, claim 21 depends on canceled claim 20.

Claim Rejections - 35 USC § 101

8. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

9. Claims 2-12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. While the claims recite a series of steps or acts to be performed, a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing. *Ex Parte Langemyr*, BPAI 2008-1495 (28 May 2008). The present claims neither transform underlying subject matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process.

Claim Rejections - 35 USC § 112

10. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

11. Claims 27-32 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 27-32 are directed to a "computer readable storage medium", first claimed as such in the amendment of 09 October 2007. There is no support in the specification for the claimed "computer-readable storage medium", with the specification instead only briefly mentioning in page 1 a "PC

platform". Accordingly, the "computer-readable storage medium" constitutes new matter.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claims 2-10, 13-19, 21-23, 25, 27-29, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,802,226 A (Dischert et al.) in view of US 6,526,099 B1 (Christopolous et al.). Dischert et al. teaches a video editor that operates on frequency-domain video (abstract).

Regarding claim 2, figure 4 of Dischert et al. shows video streams inputted into analog/digital interface 402 and 404, and figure 5 shows video streams inputted into digital VCR heads 418 and 526 from the helical track of a digital video cassette. In the recording apparatus of figure 4, the data is coded within coder 410, which contains a DCT module, as shown in figure 8 (column 6: lines 22-47). This DCT encoding corresponds with the claimed step of obtaining transform coefficients representative of video data. Next, the coded data is mixed with a secondary signal in mixer 80, (column 6: lines 39-47), producing a fade effect (column 7: lines 1-26). This corresponds with the claimed step of modifying the transform coefficients to achieve a video effect.

Dischert et al. is silent on residual video data or error video data. Christopoulos et al. teaches a transcoder that operates on spatial domain or frequency domain (abstract). Regarding the residual data in claim 2, Christopoulos et al. operates on video that has been coded with motion-compensated predictive coding, according to a standard video codec such as H.261 or H.263 (column 3: lines 15-17). In predictive coding, instead of transmitting every pixel value, instead only the variation between pixels is transmitted (column 1, lines 40-49).

Dischert et al. discloses the claimed invention except for modifying residual error video data. Christopoulos et al. teaches that it was known to perform functions on predictive-coded video data. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the fade effect device of Dischert et al. to operate on predictive-coded video data, as taught by Christopoulos et al., since Christopoulos et al. states in column 1: lines 15-31, that such a modification would improve the compression ratio of a coded video signal.

Regarding claim 3, in Christopolous et al., a predictive (P) frame or a bidirectional (B) frame comprises motion compensated data comprising motion vectors and prediction error data, in accordance with a video codec such as H.263 (column 14: line 53–column 15: line 19).

Regarding claim 4, the DCT operation in DCT 60 in Dischert is considered a technique of video compression.

Regarding claim 5, the mixer of Dischert et al. operates over a time domain in which coefficients J and K vary over time to produce the fade effect (column 7: lines 1-26).

Regarding claim 6, as shown in figure 8 of Dischert et al., while a video signal may come from an uncompressed source that is encoded with the DCT transform in the mixer, a video signal may also be input into the mixer via a partial decoder comprising variable-length decoder 86, run-length decoder 84, and de-quantizer 82 (column 6: lines 29-40). Then, Dischert et al. discloses performing an effect on decoded quantized transform coefficients and performing inverse quantization.

Regarding claim 7, in Dischert et al., figure 10A shows that in mixer 80, a video signal comprising transform coefficients is first scaled by a fading coefficient J or K before being mixed with another video signal. It is respectfully submitted that either a fading coefficient that is multiplied by a first signal or a second signal that is added to the multiplied first signal may be considered the claimed "editing data" according to the present invention.

Regarding claim 8, Dischert et al. discloses that video data may be faded to black as part of a transition sequence (column 7, lines 5-9).

Regarding claim 9, Dischert et al. discloses that video data may be faded to black as part of a transition sequence (column 7, lines 5-9).

Regarding claim 10, Dischert et al. only teaches a fade to black. However, it would have been a matter of obvious design choice to one having ordinary skill in the art to fade to any desired color, since the applicant has not disclosed that fading to any

arbitrary color, including white, solves any stated problem or is for any particular purpose, and it appears the invention would perform equally well with fading to white.

Regarding claim 13, figure 8 of Dischert et al. discloses dequantizer 82 in a video mixer that produces dequantized transform coefficients (column 6: line 40). This corresponds with the claimed "inverse quantizer". These transform coefficients are then combined with transform coefficients from another source in mixer 80 (column 6: lines 40-47) to produce a fade effect. Then, mixer 80 corresponds with the claimed "summer", and the mixed signal corresponds with the claimed "further data".

Regarding claim 14, figure 8 of Dischert et al. discloses variable quantizer 62 that performs quantizing on the mixed signal (column 6: line 26).

Regarding claim 15, in Christopolous et al., a decoder such as for example one shown in the transform-domain transcoder of figure 9 includes a transform domain motion compensation module TD/MC. In the combination with Dischert et al., this would be added to the datapath of figure 8 after dequantizer 82. Then, this motion compensation module corresponds with the claimed "predictor", and the DCT 60 of Dischert et al., which would provide "editing data" relative to the partially decoded data, corresponds with the claimed "transform module".

Regarding claim 16, in Dischert et al., figure 10A shows that in mixer 80, a video signal comprising transform coefficients is first scaled by a fading coefficient J or K before being mixed with another video signal. It is respectfully submitted that either a fading coefficient that is multiplied by a first signal or a second signal that is added to

the multiplied first signal may be considered the claimed "editing data" according to the present invention.

Regarding claim 17, summer 80 in Dischert et al. combines transform coefficients according to coefficients J and K which vary over time to produce the fade effect (column 7: lines 1-26). Then, coefficient J or K corresponds with the claimed "editing data" that produces a video effect "in a time domain".

Regarding claim 18, this claim, and dependent claims 19, 21-23, and 25, are in means-plus-function format and so 35 U.S.C. 112, sixth paragraph, applies. Then, these claims must be interpreted as particular to the structure disclosed in the specification. *In re Donaldson Co.*, 16 F.3d 1189, 29 USPQ2d 1845 (Fed. Cir. 1994). In the present case, the datapath of figures 8 and 10A of Dischert et al. comprising dequantizer 82, multiplier 104, adder 105, and quantizer 62 is considered analogous to the datapath of figure 4 of the present invention comprising inverse quantizer 20, multiplier 22, adder 24, and quantizer 26. In particular to the limitations of claim 18, ECC decoder 512 of Dischert et al., which extracts a digital video signal from a bitstream comprising audio and video data (column 5: lines 24-26) and provides the video signal to mixer 80 (column 6: lines 29-34), corresponds with the claimed means for providing a bitstream indicative of video data, considered as demultiplexer 10 in figure 4 of the present invention, and mixer 80, which performs a partial decoding to the DCT coefficients and combines the digital video with a fading coefficient and another video bitstream to produce a fade effect corresponds with the claimed means for

obtaining transform coefficients and combining editing data to produce a modified bitstream, considered as editing module 5 in figure 4 of the present invention.

Regarding claim 19, dequantizer 82 of Dischert et al. corresponds with the claimed inverse quantization module.

Regarding claim 21, mixer 80 of Dischert et al. corresponds with the claimed combining module.

Regarding claim 22, the examiner takes Official Notice that video cameras were well-known at the time of the invention as a source for providing video data, such as to an analog/digital interface of Dischert et al.

Regarding claim 23, Christopoulos et al. teaches that it was known to input digital video from a receiver (column 9, lines 11-13, 19-35)

Regarding claim 25, since the specification of the present invention does not describe or limit the structure of a storage medium (column 14: lines 21-23), the video cassette of Dischert et al. is considered to be encompassed by the claimed means for storing a video signal.

Regarding claim 27, at least Christopolous et al. may be implemented in hardware or software (column 8: lines 31-32, 66-67).

Regarding claim 28, in Dischert et al., a set of transform coefficients is multiplied by a fade coefficient J or K (column 6: line 67–column 7: line 11).

Regarding claim 29, in Dischert et al., two modified sets of transform coefficients are added to produce a final mixed video stream (column 7: lines 11-12).

Regarding claim 31, Dischert et al. discloses that video data may be faded to black as part of a transition sequence (column 7, lines 5-9).

14. Claims 11-12 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dischert et al. in view of Christopoulos et al. as applied to claims 1 and 27 above, and further in view of US Patent 5,477,276A (Oguro). Although Dischert et al. teaches a video editor that performs basic operations such as a dissolve, a cross-fade, and a fade to black on frequency-domain data, it does not teach advanced editing effects. Oguro teaches a DSP apparatus that performs advanced fading effects. Regarding the fade from one color to another in claims 11 and 32, Oguro can fade in or fade out to any arbitrary color (column 11, lines 22-27; lines 46-51). Regarding the fade to monochrome in claim 12, the fade system of Oguro may operate only on Y (luminance) values and not process C (chrominance) values, thus performing only black-and-white fade operations (column 11, lines 6-21).

Dischert et al., in combination with Christopoulos et al., discloses the claimed invention except for advanced fading techniques. Oguro teaches that it was known to perform fading techniques such as a fade to color or monochromatic fade. Therefore, it would have been obvious to one having ordinary skill of the art at the time the invention was made to apply the fading of Oguro to the editor of Dischert et al., since Oguro states in column 11, lines 29-51 that such a modification would simplify the circuitry needed in a fading device.

Conclusion

15. This action is non-final due to the new rejection of claims 2-12 under 35 U.S.C. §101.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571)272-9662. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. N. W./
Examiner, Art Unit 2621

/Mehrdad Dastouri/
Supervisory Patent Examiner, Art Unit 2621

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Receipt date: 10/14/2008

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Page No.: 1 of: 1

INFORMATION DISCLOSURE CITATION FORM FOR PATENT APPLICATION (FORM PTO-1449) (Substitute)	Docket No.: 944-001.121 Applicant(s): Kurceren, et al Filing Date: December 16, 2003	Serial No.: 10/737,184 Group: 2621

U.S. PATENTS

Initials	Patent Number	Issue Date	Name	Class	Sub-class	Filing date
/D.N.W./	6,104,441	8/15/2000	Wee, et al	348	722	
/D.N.W./	6,445,828	9/3/2002	Yim	382	250	
/D.N.W./	6301,428	10/9/2001	Linzer	386	52	
/D.N.W./	6,151,359	11/21/2000	Acer, et al	375	240	
/D.N.W./	6,314,139	11/6/2001	Koto, et al	375	240.12	

U.S. PATENT PUBLICATIONS

Initials	Publication No.	Pub. Date	Name	Class	Sub-class	Filing Date

FOREIGN PATENT DOCUMENTS

Initials	Document Number	Date	Country	Name	Translation? Yes/No/n/a
/D.N.W./	WO 99/18735	4/15/99	International		In English

OTHER DOCUMENTS (Title, Author, Date, Pages, Etc., if known)

	~~IEEE 0-7803-6297-7/00; Egawa et al.; "Compressed Doman MPEG-2 Video Editing with VBV Requirement"; pp. 1016-1019; 2000.~~
	~~IEEE Journal on Selected Areas in Communications, vol. 13, No. 1, 0733-8716/95; S. Chang et al; "Manipulation and Compositing of MC-DCT Compressed Video"; pp. 1-10; 1995.~~
	~~IEEE 0-7803-6297-7/00; A. Yoneyama et al.; "Fast Dissolve Operations for MPEG Video Contents"; pp. 291-294; 2000~~
	~~IEEE 0272-17-16/93/0900-0034503.00 1993, Algorithms for Manipulating Compressed Images, Brian C. Smith and Lawrence A. Rowe, 1993~~

Examiner's Signature: /David Werner/	Date Considered: 10/25/2008

Initial if reference was considered, whether or not citation is in conformance with MPEP. Mark through citation if not considered. Include a copy of this citation form with your next correspondence to the Applicant(s).

Customer No.: 4955

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.N.W./

Notice of References Cited	Application/Control No. 10/737,184	Applicant(s)/Patent Under Reexamination KURCEREN ET AL.	
	Examiner David N. Werner	Art Unit 2621	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,479,265	12-1995	Kim et al.	386/124
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	ITU-T Recommendation H.263, "Video Coding for Low Bit Rate Communication", 02-1998.
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.263

(02/98)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Coding of moving video

Video coding for low bit rate communication

ITU-T Recommendation H.263

(Previously CCITT Recommendation)

TR is TRP is not available at the decoder, the decoder may send a forced INTRA update signal to the encoder by external means (for example, Recommendation H.245). Unless a different frame storage policy is negotiated by external means, correctly decoded video picture segments shall be stored into memory for use as later reference pictures on a first-in, first-out basis as shown in Figure N.1 (except for B-pictures, which are not used as reference pictures), and video picture segments which are detected as having been incorrectly decoded should not replace correctly decoded ones in this memory area.

An Acknowledgment message (ACK) and a Non-Acknowledgment message (NACK) are defined as back-channel messages. An ACK may be returned when the decoder decodes a video picture segment successfully. NACKs may be returned when the decoder fails to decode a video picture segment, and may continue to be returned until the decoder gets the expected forward channel data which includes the requested TRP or an INTRA update. Which types of message shall be sent is indicated in the RPSMF field of the picture header of the forward-channel data.

In a usage scenario known as "Video Redundancy Coding", the Reference Picture Selection mode may be used by some encoders in a manner in which more than one representation is sent for the pictured scene at the same temporal instant (usually using different reference pictures). In such a case in which the Reference Picture Selection mode is in use and in which adjacent pictures in the bitstream have the same temporal reference, the decoder shall regard this occurrence as an indication that redundant copies have been sent of approximately the same pictured scene content, and shall decode and use the first such received picture while discarding the subsequent redundant picture(s).

ANNEX O

Temporal, SNR, and Spatial Scalability mode

This annex describes the optional mode of this Recommendation in support of Temporal, SNR, and Spatial Scalability. This mode may also be used in conjunction with error control schemes. The capability of this mode and the extent to which its features are supported is signaled by external means (for example, Recommendation H.245). The use of this mode is indicated in PLUSPTYPE.

O.1 Overview

Scalability allows for the decoding of a sequence at more than one quality level. This is done by using a hierarchy of pictures and enhancement pictures partitioned into one or more layers. There are three types of pictures used for scalability: B-, EI-, and EP-pictures, as explained below. Each of these has an enhancement layer number ELNUM that indicates to which layer it belongs, and a reference layer number RLNUM that indicates which layer is used for its prediction. The lowest layer is called the base layer, and has layer number 1.

Scalability is achieved by three basic methods: temporal, SNR, and spatial enhancement.

O.1.1 Temporal scalability

Temporal scalability is achieved using bidirectionally predicted pictures, or B-pictures. B-pictures allow prediction from either or both a previous and subsequent reconstructed picture in the reference layer. This property generally results in improved compression efficiency as compared to that of P-pictures. These B-pictures differ from the B-picture part of a PB- (or Improved PB-) frame (see Annexes G and M) in that they are separate entities in the bitstream: they are not syntactically intermixed with a subsequent P- (or EP-) picture.

B-pictures (and the B-part of PB- or Improved PB-frames) are not used as reference pictures for the prediction of any other pictures. This property allows for B-pictures to be discarded if necessary without adversely affecting any subsequent pictures, thus providing temporal scalability. Figure O.1 illustrates the predictive structure of P- and B-pictures.

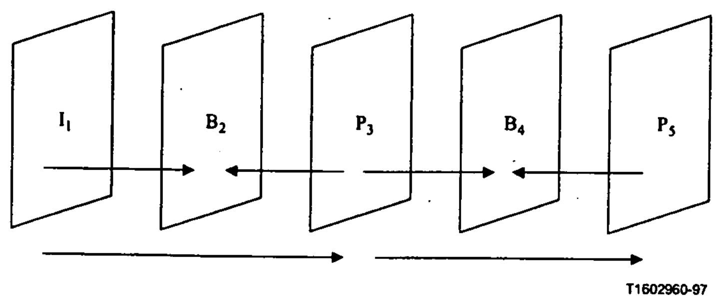

Figure O.1/H.263 – Illustration of B-picture prediction dependencies

The location of B-pictures in the bitstream is in a data-dependence order rather than in strict temporal order. (This rule is consistent with the ordering of other pictures in the bitstream, but for all picture types other than the B-picture, no such conflict arises between the data-dependence order and the temporal order.) For example, if the pictures of a video sequence were numbered 1, 2, 3, ..., then the bitstream order of the encoded pictures would be I_1, P_3, B_2, P_5, B_4, ..., where the subscript refers to the original picture number (as illustrated in Figure O.1).

There is no limit to the number of B-pictures that may be inserted between pairs of reference pictures in the reference layer (other than what is necessary to prevent temporal ambiguity from overflows of the temporal reference field in the picture header). However, a maximum number of such pictures may be signaled by external means (for example, Recommendation H.245).

The picture height, width, and pixel aspect ratio of a B-picture shall always be equal to those of its temporally subsequent reference layer picture.

Motion vectors are allowed to extend beyond the picture boundaries of B-pictures.

O.1.2 SNR scalability

The other basic method to achieve scalability is through spatial/SNR enhancement. Spatial scalability and SNR scalability are equivalent except for the use of interpolation as is described shortly. Because compression introduces artifacts and distortions, the difference between a reconstructed picture and its original in the encoder is (nearly always) a nonzero-valued picture, containing what can be called the coding error. Normally, this coding error is lost at the encoder and never recovered. With SNR scalability, these coding error pictures can also be encoded and sent to the decoder, producing an enhancement to the decoded picture. The extra data serves to increase the signal-to-noise ratio of the video picture, and hence, the term SNR scalability. Figure O.2 illustrates the data flow for SNR scalability. The vertical arrows from the lower layer illustrate that the picture in the enhancement layer is predicted from a reconstructed approximation of that picture in the reference (lower) layer.

If prediction is only formed from the lower layer, then the enhancement layer picture is referred to as an EI-picture. It is possible, however, to create a modified bidirectionally predicted picture using both a prior enhancement layer picture and a temporally simultaneous lower layer reference picture. This type of picture is referred to as an EP-picture or "Enhancement" P-picture. The prediction flow for EI- and EP-pictures is shown in Figure O.2. (Although not specifically shown in Figure O.2, an

EI-picture in an enhancement layer may have a P-picture as its lower layer reference picture, and an EP-picture may have an I-picture as its lower-layer enhancement picture.)

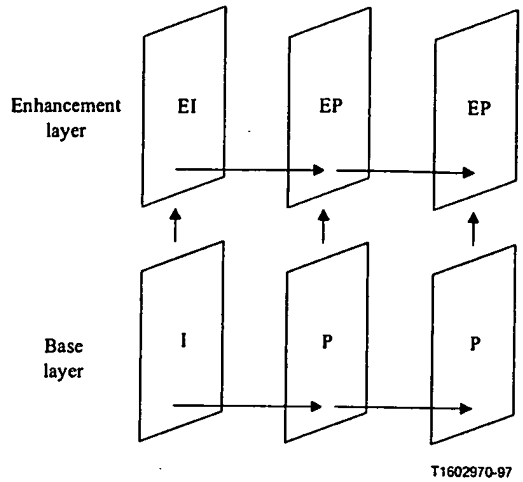

Figure O.2/H.263 – Illustration of SNR scalability

For both EI- and EP-pictures, the prediction from the reference layer uses no motion vectors. However, as with normal P-pictures, EP-pictures use motion vectors when predicting from their temporally prior reference picture in the same layer.

O.1.3 Spatial scalability

The third and final scalability method in the Temporal, SNR, and Spatial Scalability mode is spatial scalability, which is closely related to SNR scalability. The only difference is that before the picture in the reference layer is used to predict the picture in the spatial enhancement layer, it is interpolated by a factor of two either horizontally or vertically (1-D spatial scalability), or both horizontally and vertically (2-D spatial scalability). The interpolation filters for this operation are defined in O.6. For a decoder to be capable of some forms of spatial scalability, it may also need to be capable of custom picture formats. For example, if the base layer is sub-QCIF (128 × 96), the 2-D spatial enhancement layer picture would be 256 × 192, which does not correspond to a standard picture format. Another example would be if the base layer were QCIF (176 × 144), with the standard pixel aspect ratio of 12:11. A 1-D horizontal spatial enhancement layer would then correspond to a picture format of 352 × 144 with a pixel aspect ratio of 6:11. Thus a custom picture format would have to be used for the enhancement layer in these cases. An example which does not require a custom picture format would be the use of a QCIF base layer with a CIF 2-D spatial enhancement layer. Spatial scalability is illustrated in Figure O.3.

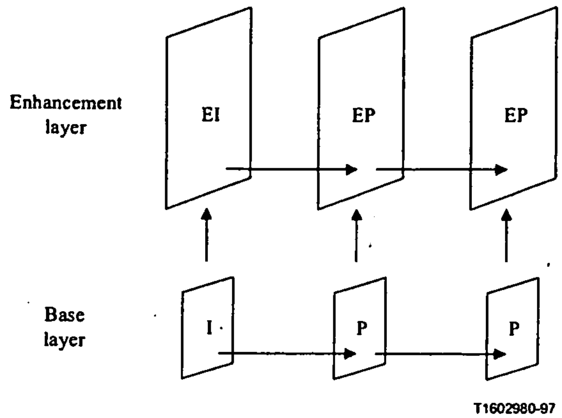

Figure O.3/H.263 – Illustration of spatial scalability

Other than requiring an upsampling process to increase the size of the reference layer picture prior to its use as a reference for the encoding process, the processing and syntax for a spatial scalability picture is functionally identical to that for an SNR scalability picture.

Since there is very little syntactical distinction between pictures using SNR scalability and pictures using spatial scalability, the pictures used for either purpose are called EI- and EP-pictures.

The picture in the base layer which is used for upward prediction in an EI- or EP-picture may be an I-picture, a P-picture, or the P-part of a PB- or Improved PB-frame (but shall not be a B-picture or the B-part of a PB- or Improved PB-frame).

O.1.4 Multilayer scalability

It is possible not only for B-pictures to be temporally inserted between pictures of types I, P, PB, and Improved PB, but also between pictures of types EI and EP, whether these consist of SNR or spatial enhancement pictures. It is also possible to have more than one SNR or spatial enhancement layer in conjunction with a base layer. Thus, a multilayer scalable bitstream can be a combination of SNR layers, spatial layers, and B-pictures. The size of a picture cannot decrease, however, with increasing layer number. It can only stay the same or increase by a factor of two in one or both dimensions. Figure O.4 illustrates a multilayer scalable bitstream.

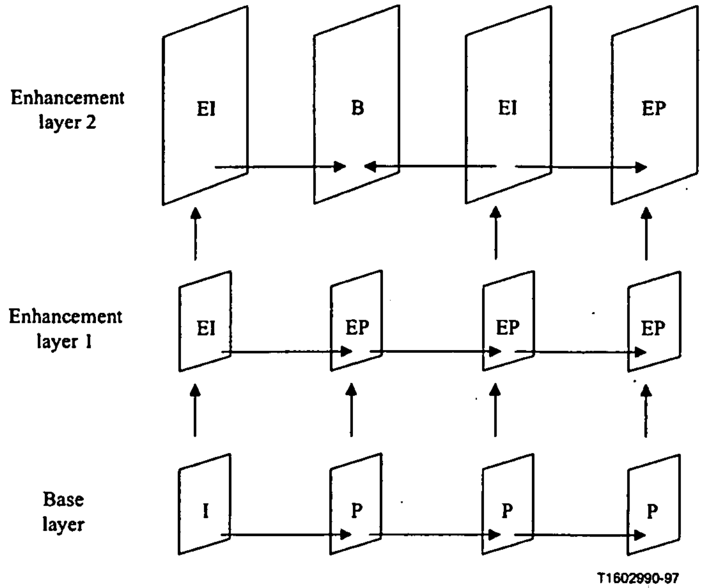

Figure O.4/H.263 – Illustration of multilayer scalability

In the case of multilayer scalability, the picture in a reference layer which is used for upward prediction in an EI- or EP-picture may be a I-, P-, EI-, or EP-picture, or may be the P-part of a PB- or Improved PB-frame in the base layer (but shall not be a B-picture or the B-part of a PB- or Improved PB-frame).

As with the two-layer case, B-pictures may occur in any layer. However, any picture in an enhancement layer which is temporally simultaneous with a B-picture in its reference layer must be a B-picture or the B-picture part of an PB- or Improved PB-frame. This is to preserve the disposable nature of B-pictures. Note, however, that B-pictures may occur in layers that have no corresponding picture in lower layers. This allows an encoder to send enhancement video with a higher picture rate than the lower layers.

The enhancement layer number and the reference layer number for each enhancement picture (B-, EI-, or EP-) are indicated in the ELNUM and RLNUM fields, respectively, of the picture header (when present). See the inference rules described in 5.1.4.4 for when these fields are not present. If a B-picture appears in an enhancement layer in which temporally surrounding SNR or spatial scalability pictures also appear, the Reference Layer Number (RLNUM) of the B-picture shall be the same as the Enhancement Layer Number (ELNUM).

The picture height, width, and pixel aspect ratio of a B-picture shall always be equal to those of its temporally subsequent reference layer picture.

O.2 Transmission order of pictures

Pictures which are dependent on other pictures shall be located in the bitstream after the pictures on which they depend.

The bitstream syntax order is specified such that for reference pictures (i.e. picture having types I, P, EI, or EP, or the P-part of PB or Improved PB), the following two rules shall be obeyed:

1) All reference pictures with the same temporal reference shall appear in the bitstream in increasing enhancement layer order (since each lower layer reference picture is needed to decode the next higher layer reference picture).

2) All temporally simultaneous reference pictures as discussed in item 1) above shall appear in the bitstream prior to any B-pictures for which any of these reference pictures is the first temporally subsequent reference picture in the reference layer of the B-picture (in order to reduce the delay of decoding all reference pictures which may be needed as references for B-pictures).

Then, the B-pictures with earlier temporal references shall follow (temporally ordered within each enhancement layer).

The bitstream location of each B-picture shall comply with the following rules:

1) Its bitstream location shall be after that of its first temporally subsequent reference picture in the reference layer (since the decoding of the B-picture generally depends on the prior decoding of that reference picture).

2) Its bitstream location shall be after that of all reference pictures that are temporally simultaneous with the first temporally subsequent reference picture in the reference layer (in order to reduce the delay of decoding all reference pictures which may be needed as references for B-pictures).

3) Its bitstream location shall precede the location of any additional temporally subsequent pictures other than B-pictures in its reference layer (since to allow otherwise would increase picture-storage memory requirements for the reference layer pictures).

4) Its bitstream location shall be after that of all EI- and EP-pictures that are temporally simultaneous with the first temporally subsequent reference picture.

5) Its bitstream location shall precede the location of all temporally subsequent pictures within its same enhancement layer (since to allow otherwise would introduce needless delay and increase picture-storage memory requirements for the enhancement layer).

Figure O.5 illustrates two allowable picture transmission orders given by the rules above for the layering structure shown therein (with numbers in dotted-line boxes indicating the bitstream order, separated by commas for the two alternatives).

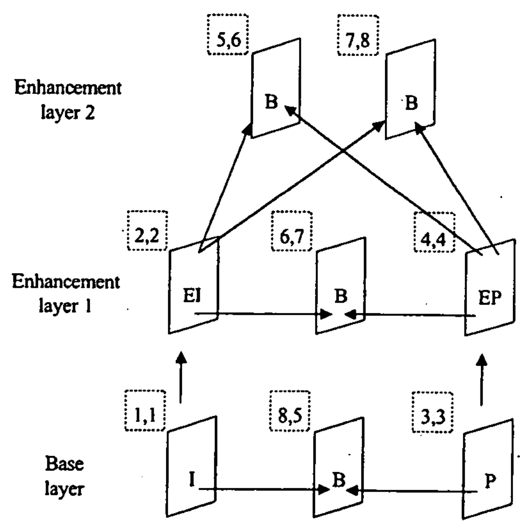

Figure O.5/H.263 – Example of picture transmission order